



Contact: Shelley Dawicki
508-495-2378
shelley.dawicki@noaa.gov

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Impacts of Ocean Warming on Marine Life Focus of IUCN Report

A new report on ocean warming, explaining the impacts, scale, and consequences on weather, the oceans, marine ecosystems and species, has been released by the International Union for Conservation of Nature (IUCN). Two NOAA Fisheries scientists, Vincent Saba and Bruce Collette, are among the 80 international authors of the 450-page report, released September 5 by the IUCN at its World Conservation Congress in Hawaii.

Vincent Saba of the NOAA Fisheries Northeast Fisheries Science Center (NEFSC), who works at the Geophysical Fluid Dynamics Laboratory at Princeton University, is one of two authors of the chapter on marine turtles and climate change. With co-author Mariana Fuentes of Florida State University, Saba reviewed known data about all seven marine turtle species around the world and found that all would be affected by climate changes, with some populations possibly already responding to changes in climate. Impacts will vary by location, timing, and between species and populations.

Because marine turtles use both oceanic and beach habitats during their lifetimes, impacts of climate change must be assessed at each of these habitats separately. "We focused much of our review on the nesting beaches because that is where the majority of the impacts on all marine turtle species will occur," said Saba, whose Ph.D. research focused on leatherbacks and climate variability. He has worked on numerous studies involving the impacts of climate change on marine turtles and other marine taxa.

"At nesting beaches, warming temperatures, changes in rainfall and rising sea level will impact incubating eggs buried in the sand and affect embryo development, hatching success, emergence rate, and the sex ratios of the hatchlings," Saba said. "Rising sea level and changing weather patterns resulting in more storms could threaten nesting sites, resulting in higher egg mortality and reduced recruitment."

Turtles have strong nesting site fidelity, meaning they will return many years later to the nesting beach where they once hatched. "Marine turtles might imprint while they are incubating within the nest, using the magnetic cues from the nesting beach," Saba said. "Loggerheads are the most common sea turtle in the eastern U.S., primarily nesting between North Carolina and Florida."

In the ocean, where turtles spend most of their lives, warming oceans can expand the habitat of cold-blooded animals such as fish and marine turtles. "Marine turtles are estimated to

live 60-100 years, the same time scale that substantial global warming is projected to occur,” Saba said. “We don’t know if these long-lived marine species can adapt in such little time.”

The report recommends long-term monitoring of nesting sites and ocean habitats for the seven turtle species worldwide.

Bruce Collette of the NOAA Fisheries National Systematics Laboratory, located at the Smithsonian Institution’s National Museum of Natural History in Washington, DC, is one of the five authors of the chapter on the effects of ocean warming on pelagic tunas. He and colleagues note that predictions of how pelagic or open ocean tunas and billfishes respond to rising global surface and subsurface ocean temperatures have been based on model simulations and observations.

“How individual populations will respond to rising ocean temperatures and effects of other climate change outcomes are unknown,” said Collette, who has spent his more than 55-year career at NOAA Fisheries studying tunas and billfishes and is considered one of the leading ichthyologists in the world. “Open ocean tunas and billfishes could adopt new cooler subtropical areas for spawning and replace or add to existing tropical spawning sites, or alter the timing and length of their spawning season.”

These changes could in turn alter the distribution and survival rates of larvae and young age classes at existing or new spawning grounds. Populations could also change where they look for food, moving to higher latitudes in different locations, and change their depth distribution. The location of tuna fishing grounds and the types of gear used for catching specific species or stocks would also be affected.

“I worry about the effect on spawning populations of all three species of bluefin tunas (Atlantic, Pacific and Southern) because the temperatures in their spawning sites are already approaching their limits of heat tolerance,” said Collette, who is chair of the IUCN’s Species Survival Commission Tuna and Billfish Specialist Group.

While a graduate student at Cornell University in 1957, Collette participated in one of the first exploratory fishing cruises investigating tuna resources off the coast of New England on the Northeast Fisheries Science Center’s fisheries survey vessel *Delaware*. Since then, much of Collette’s professional career has been involved with the anatomy, systematics, and evolution of tunas and other members of the family Scombridae (tunas, bonitos, mackerels and Spanish mackerels).

The release of the report was one of many activities underway at the World Conservation Congress, where researchers, government officials and environmentalists are meeting September 1-9 to share knowledge and expertise on how to manage our natural environment. The Congress is held every four years and is the world’s largest environmental and nature conservation event, attracting 6,000 delegates. This is the first time the meeting has been held in the United States. Among the speakers is Dr. Kathryn Sullivan, Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator.

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Related links:

Explaining Ocean Warming: Causes, Scale, Effects and Consequences:

https://portals.iucn.org/library/sites/library/files/documents/2016-046_0.pdf

World Conservation Congress: <http://www.iucnworldconservationcongress.org/programme>

NEFSC Tuna and Billfish Researcher Adds Expertise to IUCN Red List Study:

<http://www.nefsc.noaa.gov/news/features/collette/>

Adélie Penguin Population in Antarctica Threatened by Climate Change:

http://www.nefsc.noaa.gov/press_release/pr2016/scispot/ss1610/

Northwest Atlantic Ocean May Get Warmer, Sooner:

http://www.nefsc.noaa.gov/press_release/pr2016/scispot/ss1601/